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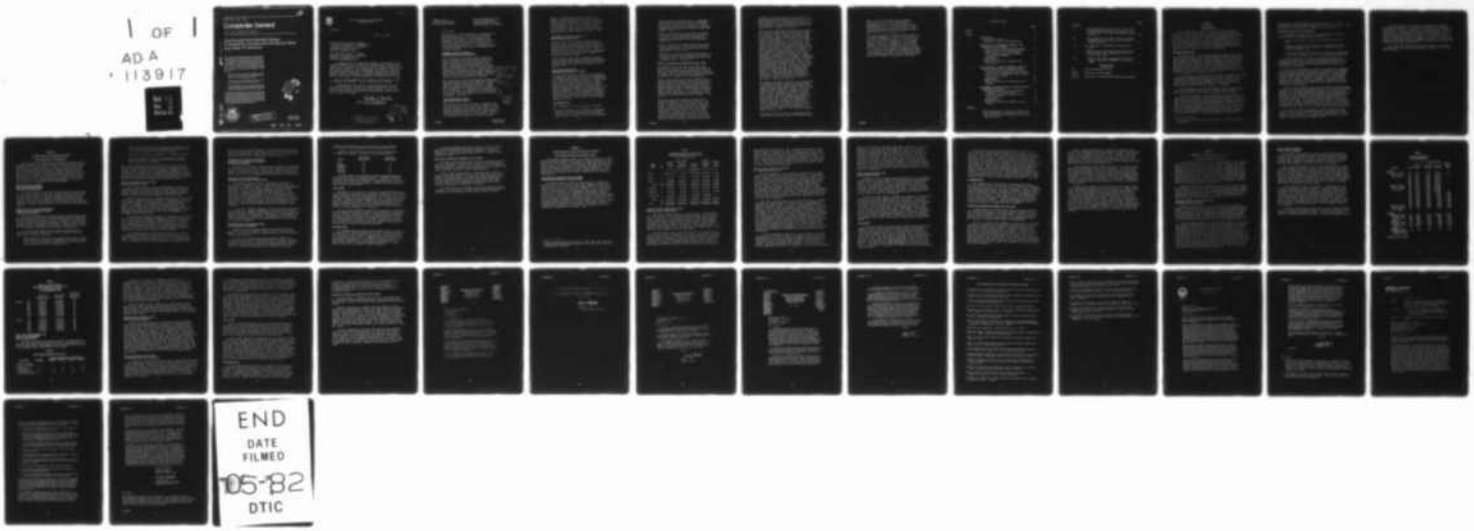

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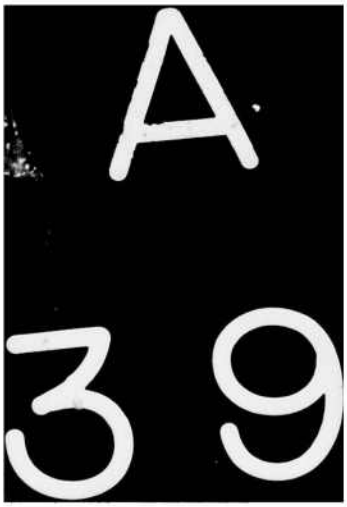
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REPORT BY THE

Comptroller General

OF THE UNITED STATES

Cost Growth And Delivery Delays In Submarine Construction At Electric Boat Are Likely To Continue

The chairman of the Subcommittee on Seapower and Strategic and Critical Materials, House Armed Services Committee, and the chairman of the Subcommittee on Defense, House Appropriations Committee, asked GAO to evaluate Electric Boat's ability to build submarines in a timely and cost-effective manner and review other aspects concerning Electric Boat and its submarine construction programs. GAO found that

--although the Navy and Electric Boat have taken steps to improve their quality assurance programs, more improvement is needed;

--cost growth on the SSN-688 and Trident submarine contracts are likely to continue; and

--some SSN-688 and Trident submarine delivery dates may not be met unless unfavorable human resources and productivity trends are reversed.

The Navy should improve its reviews and evaluations of Electric Boat's quality assurance procedures and monitor the implementation of Electric Boat's upgraded quality assurance program. The Department of Defense should periodically report to the appropriate congressional committees on the status of cost and schedule progress at Electric Boat.

UNITED STATES GENERAL ACCOUNTING OFFICE

MASAD-82-29
APRIL 19, 1982

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COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON D.C. 20548

B-203670

April 19, 1982

The Honorable Charles E. Bennett
Chairman, Subcommittee on Seapower and
Strategic and Critical Materials
Committee on Armed Services
House of Representatives

The Honorable Joseph P. Addabbo
Chairman, Subcommittee on Defense
Committee on Appropriations
House of Representatives

In response to your respective requests, we provided a side-by-side comparison of the Navy's and Electric Boat's testimonies, Department of Defense's and Electric Boat's written comments on the draft report along with our responses to the comments, briefings, and other information to your representatives on the Trident and SSN-688 submarine programs. This report addresses the remaining points raised in your requests regarding these construction programs at the General Dynamics Corporation, Electric Boat Division.

We are sending copies of this report to the Director, Office of Management and Budget, and to the Secretary of Defense.

As arranged with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days from the date of the report. At that time we will send copies to interested parties and make copies available to others on request.

Shelton J. Dorsey

Acting Comptroller General
of the United States

REPORT BY THE
COMPTROLLER GENERAL
OF THE UNITED STATES

COST GROWTH AND DELIVERY DELAYS IN SUBMARINE CONSTRUCTION AT ELECTRIC BOAT ARE LIKELY TO CONTINUE

D I G E S T

The chairman of the Subcommittee on Seapower and Strategic and Critical Materials, House Armed Services Committee, and the chairman of the Subcommittee on Defense, House Appropriations Committee, asked GAO to evaluate Electric Boat's ability to build submarines in a timely and cost-effective manner and to review other aspects concerning Electric Boat and its submarine construction program.

UPGRADED QUALITY ASSURANCE PROGRAMS STILL NEED IMPROVEMENT

It is too early to accurately assess Electric Boat's upgraded quality assurance program, but GAO believes that the new procedures, if followed, could provide greater assurance that quality submarines are constructed at Electric Boat. Some weaknesses which led to past quality assurance problems still exist. Specifically, weaknesses in implementing inspection procedures and in obtaining and verifying timely corrective actions could lead to quality-related problems similar to those experienced in the past.

Over the years, the Naval Sea Systems Command has identified weaknesses in the Supervisor of Shipbuilding's quality assurance program to ensure that contractual requirements are met. Steps taken to date have not corrected all the identified weaknesses. The Supervisor of Shipbuilding has not been able to keep pace with its scheduled evaluations of Electric Boat's quality assurance procedures. (See ch. 2.)

COST GROWTH WILL LIKELY CONTINUE ON BOTH PROGRAMS

Cost growth will likely continue at Electric Boat because the direct labor budgets, although revised over the years, still do not reflect all the hours needed to complete the SSN-688 and Trident programs. Although the Navy knew the Electric Boat budgets were unrealistically low, it continued to use them as the basis for original and updated contract

costs. The Trident and SSN-688 contracts, awarded in January and February 1982, respectively, reflect substantial increases in direct labor hours to build these submarines over previous contracts. The Navy believes pricing structures and target costs for these contracts are reasonable. This should minimize the cost growth problems experienced in the past. (See ch. 3.)

MANAGEMENT ATTENTION NEEDED TO MEET SCHEDULED DELIVERIES

Electric Boat delivered six SSN-688s and one Trident in 1981. In achieving these deliveries, Electric Boat concentrated its labor force on these submarines at the expense of the remaining submarines still under construction. Consequently, Electric Boat must make up lost progress on follow-on boats within current schedules to meet future delivery dates.

Unless Electric Boat takes immediate action to reverse unfavorable human resources and productivity trends, some scheduled SSN-688 and Trident delivery dates at Electric Boat may not be met. (See ch. 4.)

NAVY AND ELECTRIC BOAT TESTIMONIES CLOUDED THE ISSUES

In March 1981 the Navy testified on the status of submarine construction before the Subcommittee on Seapower and Strategic and Critical Materials, House Committee on Armed Services. In that testimony, it criticized Electric Boat for shoddy construction and poor quality control and held Electric Boat responsible for high cost and delivery delays of SSN-688 and Trident submarines under construction. Electric Boat defended its position before the same subcommittee refuting the Navy's criticisms and asserting that defective Government-furnished equipment and design changes were major contributors to its problems. (See pp. 1 and 2.)

RECOMMENDATIONS

GAO recommends that the Secretary of Defense:

--Require the Navy to accelerate its reviews of Electric Boat's quality assurance procedures. Moreover, the Navy and Electric Boat should work closely to improve its existing management

control systems to ensure that (1) inspection procedures are being effectively implemented, (2) corrective actions are taken on a timely basis, and (3) preventive measures are properly implemented before quality problems become widespread. (See p. 7.)

--Direct that realistic estimates for contracts at Electric Boat be developed and reported to the Office of the Secretary of Defense and concerned congressional oversight committees. (See p. 13.)

--Direct the Navy to maintain close surveillance over the contractor's activities to identify progress being made or indications of unfavorable trends. (See p. 20.)

--Apprise the Congress of progress being made at Electric Boat and the impact any unfavorable trends may have on cost and schedule deliveries at Electric Boat. (See p. 21.)

AGENCY AND CONTRACTOR COMMENTS AND GAO VIEWS

In commenting on a draft of this report, the Department of Defense (DOD) agreed that there is room for improvement in both Electric Boat's and the Supervisor of Shipbuilding's quality assurance programs. DOD also cited actions taken by the Navy to satisfy the intent of the recommendation.

Electric Boat believes that it currently has in place a quality assurance system which may well exceed that of any shipyard in the United States. Electric Boat has full confidence that its improved program ensures the quality of submarines built at Electric Boat. Since changes are being made to both programs, it is too early to fully assess their effectiveness in preventing the recurrence of past quality-related problems. (See p. 8.)

DOD stated that GAO improperly defined cost growth and assumed a relationship between cost growth at Electric Boat and growth in the Navy budget. Further, DOD stated that GAO implied that the Navy knowingly entered into contracts at Electric Boat at target costs which were understated. Electric Boat stated that GAO's discussion regarding cost growth was a resurrection of past problems focusing on bid estimates of early contracts. Further, they stated that GAO did not give proper recognition to the

imbalance of various trades in the labor work force during 1980 and 1981 due to the weld review program and the high concentration of ships at the waterfront or to cost savings resulting from its automated cylinder manufacturing facility at Quonset Point. (See pp. 13 and 14.)

GAO's use of target costs to measure contractor's cost growth is consistent with the cost, schedule, and performance criteria specified in DOD instructions. DOD's statement that GAO assumed a relationship between cost growth in the Navy budget is misleading. It was not GAO's intention to relate the Navy budget to cost growth. The report clearly addresses cost growth under the contracts and states that contract target costs, which are the basis for measuring contractor cost growth, have been and continue to be based on Electric Boat's unrealistically low direct labor hour budgets. The Navy knowingly uses these estimates. Regarding the resurrection of past problems, this could not be avoided in presenting an assessment of future cost problems. GAO maintains that it did give sufficient weight to the issues mentioned by Electric Boat. GAO's analyses specifically excluded costs and direct labor hours associated with the weld, paint, and nonconforming steel problems. Furthermore, GAO believes its analysis depicts the reasonable costs, in terms of direct labor, necessary to construct an SSN-688 submarine under normal conditions. Any adverse impact on productivity for any reason will result in an increase in the costs. (See pp. 13 and 14.)

DOD agreed with GAO's conclusion that some delays in submarine deliveries may occur beyond 1982 unless Electric Boat corrects unfavorable human resources and productivity trends. Electric Boat stated, however, that GAO's analyses of their schedules are inadequate. Further, the diversion of human resources necessary to deliver seven ships in 1981 did cause a trade imbalance, but did not result in unrecoverable delays. Electric Boat also stated that improvements in productivity must take place to achieve its current estimates for scheduled deliveries on both the SSN-688 and Trident programs and that it expects the steps that have been and are being taken will result in the necessary improvements. (See p. 21.)

On March 17, and 31, 1982, in testimony before the Congress, the Navy stated that Electric Boat

will be late in meeting contract schedule deliveries for six of the eight Trident submarines unless Electric Boat takes strong management actions. The Navy stated that until the fundamental issue of productivity is vigorously addressed, past Navy and Electric Boat problems will recur. (See p. 15.)

The covering letters transmitting DOD and Electric Boat comments on a draft of this report are included as appendixes V and VI, respectively. The full text of the comments are not included because they are too voluminous. The comments, however, resulted in changes which were incorporated in the draft provided to DOD in advance of a March 25, 1982, meeting between GAO and DOD. As a result of that meeting, no substantial additional changes were made. GAO believes the agency and contractor positions have been appropriately and fairly treated in the body of the report.

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ABBREVIATIONS

GAO	General Accounting Office
NAVSEA	Naval Sea Systems Command
SUPSHIP	Supervisor of Shipbuilding Conversion and Repair

CHAPTER 1

INTRODUCTION

In the early 1970s, the Navy initiated new construction programs to expand and upgrade its ballistic missile and attack submarine fleets. The General Dynamics Corporation, Electric Boat Division, is the designer and sole builder of the Trident class ballistic missile submarine. Newport News Shipbuilding and Drydock Company, a division of Tenneco, and Electric Boat both build the Newport News designed SSN-688 Los Angeles class attack submarines. The December 1981 selected acquisition report shows that the total cost of procuring 15 Tridents and 56 SSN-688s will be $20.5 billion and $24.3 billion, respectively.

PROGRAM DESCRIPTIONS

The Trident will replace the present Polaris/Poseidon ballistic missile fleet. It is bigger, faster, quieter, and carries more ballistic missiles than its predecessors. In July 1974 the Navy awarded a fixed-price, incentive construction contract for the first Trident to Electric Boat. Before January 1982, Electric Boat had two such contracts for eight Tridents. Electric Boat delivered the lead Trident to the Navy on October 28, 1981. In that same month, the Navy issued a request for proposal for a 9th Trident, with an option for a 10th. The contract for the ninth Trident was awarded on January 7, 1982.

The SSN-688 is a new generation of attack submarines designed to destroy enemy submarines and surface ships. The Navy issued a fixed-price, incentive construction contract to Newport News in February 1970 for the first SSN-688 and 4 later contracts for constructing 15 additional SSN-688s. As of December 10, 1981, Newport News has delivered six SSN-688s to the Navy.

Since January 1971 the Navy awarded 4 fixed-price incentive contracts to Electric Boat for 21 SSN-688s. As of December 31, 1981, Electric Boat has delivered 11 SSN-688s to the Navy.

Almost from inception, these submarine programs have been embroiled in controversy. Both construction programs at Electric Boat have experienced significant cost growth 1/ and schedule delays. In March 1981, before the Subcommittee on Seapower and Strategic and Critical Materials, House Committee on Armed Services, the Navy publicly surfaced the controversy by criticizing Electric Boat for shoddy construction, poor quality control, and the high cost of its SSN-688 submarines when compared to Newport News. Electric Boat defended its position before the same subcommittee by refuting the Navy's criticism and charging that defective

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1/Cost growth is defined as the increases in cost over contract target cost.

Government-furnished equipment and design changes were major contributors to its problems. The ensuing claims and counterclaims only served to exacerbate an already hostile situation.

OBJECTIVES, SCOPE, AND METHODOLOGY

The Seapower Subcommittee and the Subcommittee on Defense, House Committee on Appropriations, asked us to

--review the status of construction problems at Electric Boat,

--evaluate Electric Boat's ability to produce Trident and SSN-688 submarines in the future in a timely and cost-effective manner, and

--compare and analyze the conflicting testimonies presented by the Navy and Electric Boat to the Seapower Subcommittee.

As requested on May 4, 1981, we provided a side-by-side comparison of the Navy's and Electric Boat's testimonies to the chairman and staff of the Seapower Subcommittee and later to the Subcommittee on Defense, noting particularly areas of disagreement and omissions.

To meet the subcommittee requests, we interviewed Department of Defense personnel associated with the management or oversight of the SSN-688 and Trident submarine programs at the Naval Sea Systems Command (NAVSEA), the Navy's Supervisor of Shipbuilding Conversion and Repair (SUPSHIP) at Electric Boat, and Defense Contract Audit Agency officials. SUPSHIP is the Navy's representative at assigned yards responsible for performing contract administration functions and administering overhauls and repair alterations on Navy ships.

We also interviewed Electric Boat and Newport News officials. We observed Electric Boat's implementation of its quality assurance program. We reviewed Department of Defense and Electric Boat documents and discussed them with cognizant contractor and Defense officials at the contractor's facilities and Navy Headquarters. Although we obtained and analyzed computer-generated cost information provided by Electric Boat, we did not assess the reliability of this data. We selected June 27, 1981, as the baseline for measuring Electric Boat's cost growth because its cost reports on that date reflected, for the first time, the latest delivery schedule revisions and costs to correct quality assurance problems.

We did not review any aspects of Electric Boat's Quonset Point, Rhode Island, operations where the hull cylinders, components, and subsystems for both Trident and SSN-688s are fabricated. We did, however, use Electric Boat-furnished data on the quality assurance program at Quonset Point.

The covering letters transmitting Department of Defense and Electric Boat comments on a draft of this report are included in appendixes V and VI, respectively. The full text of the comments are not included because they are too voluminous. The comments, however, resulted in changes which were incorporated in the draft provided to Defense in advance of a March 25, 1982, meeting between Defense and ourselves. As a result of that meeting, no substantial additional changes were made. We believe the agency and contractor positions have been appropriately and fairly treated in the body of the report.

Our review was performed in accordance with our "Standards for Audits of Governmental Organizations, Programs, Activities, and Functions."

CHAPTER 2

UPGRADED QUALITY ASSURANCE PROGRAMS NEED ADDITIONAL IMPROVEMENTS

Electric Boat and SUPSHIP are implementing upgraded quality assurance programs, but some weaknesses which led to past quality assurance problems still exist. Electric Boat's program needs improvement to ensure that timely corrective actions are taken and that preventative measures are promptly instituted before quality problems become widespread. SUPSHIP's program has not been able to keep pace with its scheduled evaluations of Electric Boat's quality assurance procedures to ensure that contractual requirements are met. Both programs are relatively new, and it is too early to fully assess their effectiveness in preventing the recurrence of past quality-related problems.

ELECTRIC BOAT'S UPGRADED QUALITY ASSURANCE PROGRAM STILL NEEDS IMPROVEMENT

In October 1980 Electric Boat upgraded its quality assurance program to preclude the recurrence of past quality problems such as nonconforming steel, incomplete welding, and defective paint. In this program, Electric Boat established new procedures and trend analysis reports to identify, document, and report deficiencies. However, improvements are still needed in implementing inspection procedures and obtaining and verifying timely corrective actions.

Weaknesses in the implementation of Electric Boat's quality assurance inspection procedures

Appropriate inspection procedures ensure that the contract's quality requirements are met. The procedures should require that all inspections are recorded and that all defects are accounted for until appropriate corrective action is taken. Also, periodic reviews should be performed to determine if shipyard workers are following quality assurance instructions. Electric Boat, however, is not effectively implementing its inspection procedures.

In 10 audits of inspection procedures conducted between January and September 1981, Electric Boat's quality assurance audit staff found the following:

--Approximately 48 percent of the required reviews to determine if paint is applied in accordance with quality assurance instructions were not performed at Groton and 62 percent were not performed at Quonset Point.

--Of 35 shops that should be periodically reviewed to determine if quality assurance instructions are followed, 16 were not reviewed and 4 were partially done.

--Inspectors accepted and signed off on incomplete welds.

--Forty-four percent of the inspectors did not properly mark good welds as accepted which would have allowed other trade work to proceed.

As a result of these audits, Electric Boat took action on the first three weaknesses identified above. It restructured the review process to ensure that more periodic reviews are performed. Also, it instructed all inspection personnel to review drawings more closely to avoid instances where incomplete welds are accepted and signed off. Electric Boat treated the remaining problem as an isolated incident and only discussed the problem with those inspectors and supervisors directly involved.

Problems obtaining and verifying timely corrective action

Electric Boat conducts audits to determine if workers are adhering to instructions and procedures and whether corrective action responses are in writing and on time. Electric Boat, however, neither vigorously follows up on delinquent corrective action responses nor verifies reported corrective actions.

Electric Boat imposes a 15-working day limit for the shipyard work force to respond to audit reports. The purpose of this is to ensure prompt review and reaction to audit findings. Some responses, however, are outstanding well beyond this 15-day limit. For example, in its March 1981 audit, Electric Boat found that 38 of 66 pipe hangers were unsatisfactory even though they had been signed off by the work force as complete. As of September 1981, the deficiencies were still outstanding and no response had been received.

Electric Boat stated that generally, timeliness is satisfactory. As a matter of routine, subsequent audits are conducted in the same area and management is advised of the effectiveness of corrective actions related to earlier findings. Electric Boat audit managers and auditors said, however, that corrective actions and preventive measures are verified between routine audits only if an auditor knows of previous audit results when conducting an audit in or around the same location.

If a response appears reasonable, Electric Boat considers it complete and assumes corrective action has been taken. An Electric Boat quality assurance official stated that corrective action responses are not formally verified. In a November 1980 audit, for example, Electric Boat found that one shipyard shop

was not correctly marking material. The shop reported corrective action was taken, but in the February 1981 audit, the same situation was found again. Electric Boat relies on the integrity of the individuals to report and take corrective action.

SUPSHIP HAS NOT FULLY IMPLEMENTED ITS UPGRADED EVALUATION OF QUALITY ASSURANCE PROCEDURES

SUPSHIP has not fully implemented its schedule for evaluating Electric Boat's procedures to ensure that contractual quality assurance requirements are met. Even though programs have been developed to correct the numerous weaknesses identified over the years, some of the same weaknesses still existed in November 1981.

Problems in quality assurance programs have existed for many years

The SUPSHIP quality assurance program has a history of deficiencies dating back to 1973. When NAVSEA conducted its evaluation at SUPSHIP in 1976, it found that many of the problems identified in 1973 had not been corrected. In 1976 SUPSHIP submitted a plan to correct the problems identified in the 1976 audit. However, the NAVSEA followup evaluation in 1977 showed that SUPSHIP had not made all the necessary corrections, and another plan was developed. In April 1981 NAVSEA found once again that SUPSHIP still had not corrected all the problems identified in the previous years. The major weaknesses identified were in the review and evaluation of Electric Boat's procedures for ensuring that quality assurance requirements were being met.

In July 1981 SUPSHIP submitted a corrective action plan which NAVSEA accepted. However, NAVSEA was still not satisfied with the coverage that SUPSHIP had planned for ensuring that Electric Boat was meeting its contractual requirements. In September 1981 SUPSHIP responded to NAVSEA that it would continue to identify those areas with quality-related requirements and evaluate them for contract compliance.

Upgraded quality assurance program not implemented as planned

SUPSHIP has not fully implemented its quality assurance program as approved by NAVSEA. Specifically, it has not been able to meet its schedules for evaluating Electric Boat's quality assurance procedures.

As part of its quality assurance program, SUPSHIP must evaluate Electric Boat's written procedures to ensure they meet contract specifications. After the review establishes that the procedure adequately describes all the operations and actions required to meet contract provisions, SUPSHIP must conduct

procedure evaluations to verify that the written procedures are actually being implemented by the shipyard work force.

SUPSHIP is having difficulty meeting its schedules for procedure evaluations, as shown in the following table.

Month	Scheduled observation	Completed observation
July	13	7
August	17	9
September	17	6
October	37	19
November	53	23
December	51	33

The Navy agrees that procedure evaluation performance has not kept pace with the scheduled program. Although a SUPSHIP official stated that the schedules were too ambitious, the Navy attributes the lagging performance to reasons such as low activity in the work area and the necessity to support the unusually high ship delivery rate in 1981.

CONCLUSIONS

Although it is too early to accurately assess Electric Boat's upgraded quality assurance program because changes are still being made, we believe that the new procedures, if followed, will provide greater assurance that quality submarines are constructed at Electric Boat. However, some weaknesses which led to past quality assurance problems still exist. Specifically, weaknesses in implementing inspection procedures and in obtaining and verifying timely corrective actions could lead to quality-related problems similar to those experienced in the past.

Over the years, NAVSEA has identified weaknesses in SUPSHIP's quality assurance program to ensure that contractual requirements are met and that a quality product is delivered to the Government. Although it may be too early to fully assess SUPSHIP's program, the actions taken to improve the program have not corrected all the weaknesses which existed in the past. Specifically, SUPSHIP has not been able to keep pace with its scheduled evaluations of Electric Boat's quality assurance procedures.

RECOMMENDATION

We recommend that the Secretary of Defense require the Navy to accelerate its implementation of its reviews and evaluations of Electric Boat's quality assurance procedures. The Navy and Electric Boat should work closely to improve existing management control systems to ensure that (1) inspection procedures are being effectively implemented, (2) corrective actions are taken on a timely basis, and (3) preventive measures are properly implemented before quality problems become widespread.

Intensive management attention must be directed to ensure that established quality assurance guidelines in place are implemented. This attention enables management to identify potential problems early and permits steps to be taken to keep programs on track.

AGENCY AND CONTRACTOR COMMENTS AND OUR VIEWS

The Office of the Secretary of Defense agreed that there is room for improvement in both Electric Boat and SUPSHIP quality assurance programs. Defense also agreed with our recommendations concerning Electric Boat's program and cited actions taken by the Navy to satisfy the intent of the recommendation.

Electric Boat believes that it currently has in place a quality assurance system which may well exceed that of any shipyard in the United States. Electric Boat made reference to a November 1981 Navy audit which cited the notable improvements in its program since the last audit conducted in June 1980. Electric Boat has full confidence that the improved program ensures the quality of submarines it builds.

We believe that since changes are still being made to both programs, it is too early to fully assess their effectiveness in preventing the recurrence of past quality-related problems.

CHAPTER 3

COST GROWTH WILL LIKELY CONTINUE IN SSN-688 AND TRIDENT PROGRAMS AT ELECTRIC BOAT

Cost growth at Electric Boat will likely continue on the SSN-688 and Trident programs because Electric Boat consistently understates the single largest cost element in submarine construction--direct labor. The Navy has known this but has used Electric Boat's unrealistically low estimates to establish original and updated contract costs and baselines for cost growth measurement. By so doing, cost growth has been virtually ensured in each contract negotiated with Electric Boat before October 1981 for submarine construction.

COST STATUS OF THE SSN-688 AND TRIDENT CONSTRUCTION PROGRAMS AT ELECTRIC BOAT

We selected June 27, 1981, as the baseline for measuring Electric Boat's cost growth because costs reports on that date reflected, for the first time, the latest schedule revisions and costs related to correcting quality problems. As of that date, Electric Boat reported a cost growth of $21.6 million and $211.4 million in 1981 dollars for the SSN-688 and Trident programs, respectively. This growth represents the difference between the total amount Electric Boat budgeted for the work (allocated budget) and the contract baseline 1/ for each program. Electric Boat's allocated budget includes all potential work and inflation. The contract baseline includes the current target cost and the estimate of additional unpriced work authorized by the Navy. Table 1 summarizes the estimated cost growth of the SSN-688 and Trident construction programs as of June 27, 1981.

1/Contract baseline includes current target cost and negotiated changes plus estimates of authorized, unpriced work, and labor and material escalation.

Table 1

Estimated Cost Growth of Submarine Construction Reported by Electric Boat as of June 27, 1981

Boats bought	No.	Current target cost	Est. of auth. unpriced work and escalation	Contract baseline	Electric Boat's allocated budget	Estimated cost growth
		(thousands)				
688 I	7	$1,016,762	$ 8,536	$1,025,298	$1,033,495	$ 8,197
688 II	11	1,676,713	100,545	1,777,258	1,788,040	10,782
688 V	2	233,056	102,617	335,673	338,341	2,668
Total	20	2,926,531	211,698	3,138,229	3,159,876	21,647
Trident I	4	916,075	608,287	1,524,362	1,721,862	197,500
Trident II	3	924,025	429,560	1,353,585	1,367,517	13,932
Trident III	1	350,837	123,153	473,990	473,990	-
Total	8	2,190,937	1,161,000	3,351,937	3,563,369	211,432
Total	28	$5,117,468	$1,372,698	$6,490,166	$6,723,245	$233,079

ELECTRIC BOAT'S UNREALISTIC LABOR BUDGETS LEAD TO COST GROWTH

Cost growth remains likely in both programs. Although Electric Boat has revised its estimates over the years, as of June 27, 1981, it was still not reflecting sufficient labor hours to construct submarines. Establishing realistic direct labor budgets is important because direct labor represents about 40 percent of the costs to build a submarine at Electric Boat. These budgets, proposed direct labor hours converted to costs together with material and overhead costs, are the basis for negotiating original contract costs commonly called target costs.

Contract target costs, which are the base for measuring contractor cost growth, have been and continue to be based on Electric Boat's unrealistically low direct labor hour budgets for submarine construction. The Navy has known that some of these budgets were significantly below proven performance and well below its own estimates. Moreover, the Navy's direct labor hour estimates for the SSN-688 and Trident have historically been more accurate than

those made by Electric Boat. Yet, the Navy continues to accept Electric Boat's estimates and has, in effect, known since establishing original contract costs that the SSN-688 an Trident programs at Electric Boat would incur significant cost growth. The Trident and SSN-688 contracts, awarded in January and February 1982, respectively, reflect substantial increases in direct labor hours to build SSN-688 and Trident submarines over previous contracts. The Navy believes pricing structures and target costs for these contracts are reasonable.

Electric Boat labor hour budgets for SSN-688 class are low

The 688 II contract is an example of the effects of using unrealistic estimates to establish target costs. In June 1978 Electric Boat and the Navy settled an $843 million cost overrun on the SSN-688 class submarine program. Among the reasons given for the cost growth were underestimating the complexity of the SSN-688 and using a new design agent--Newport News--instead of Electric Boat. However, as early as contract negotiations, strong indications existed that Electric Boat's direct labor hours were underestimated. Electric Boat proposed to construct the SSN-688s for about the same direct labor hours as the previous SSN-637 class submarine, even though the SSN-688 displaces 2,600 more tons and is 68 feet longer. Moreover, the direct labor hour estimates were substantially below its only competitor and well below the Navy's estimate.

Even after the experience with the 668 II contract, the Navy continued to accept unrealistic direct labor hour estimates for establishing target costs. In 1979 the Navy awarded the 688 V contract to Electric Boat to construct the SSN-719 and -720, even though it knew the labor budgets were undereestimated. Electric Boat based its initial labor hour budgets on the estimated hours to complete the last boat being built under the 688 II contract, even though it was less than 2-percent complete and other SSN-688s had already been delivered. In selecting this boat as the base for its estimates, Electric Boat made a number of adjustments which reduced the direct labor hour estimates by about 12 percent. The adjustments were based entirely on projected savings from unrealized improvements in productivity. Electric Boat then reduced this adjusted base by about 7 percent to reflect other anticipated productivity improvements. The result was that 688 V budgets were estimates of estimates and did not reflect proven performance.

In a 1979 preaward survey for the 688 V contract, the Navy questioned Electric Boat's ability to realize these anticipated improvements. In fact, the survey recommended not awarding the contract to Electric Boat because, in part, the estimates were considered overly optimistic and presented a high risk for cost growth. The Navy made known its concerns in this area, both during negotiations and later in writing. Electric Boat responded

that it had carefully considered the Navy's concerns in its deliberations of its "best and tinal offer" and that it had enough confidence in the labor hour estimates to leave them unchanged. The Navy concluded that Electric Boat had adequate financial resources to complete the contract and therefore had no reason not to award the contract. However, the direct labor hours used to establish target costs were 23 percent below the Navy estimate. In effect, the Navy accepted the very high risk of a 23-percent overrun at the outset of the 688 V contract. The SSN-688 contract awarded in February 1982 reflects a substantial increase in direct labor hours to build an SSN-688 submarine over previous contracts. The Navy believes pricing structures and target costs for this contract are reasonable.

Electric Boat Trident labor hour budgets are low

Estimates for the Trident class submarine reflect anticipated learning and the use of advanced manufacturing and processing techniques, such as automatic welding. These expected efficiencies, however, were applied to labor hour projections for submarines very early in construction rather than actual experience on completed or substantially completed submarines. As such, although considerably less historical data is available because the program is relatively new, Trident program estimates are developed in a manner similar to that for the SSN-688.

As early as 1979, however, SUPSHIP was projecting a 16-percent increase in the direct labor hours for the Trident II contract. In December 1980 the SUPSHIP projection increased to 22 percent. Electric Boat and Navy officials believe that the pricing structure and target costs contained in the ninth Trident contract signed in January 1982 are reasonable. This budget shows direct labor hours that are 23 percent higher than its November 1981 budgets for the three boats under the Trident II contract. During negotiations for the ninth Trident, Electric Boat informally advised the Navy of forthcoming significant increases in labor hour budgets for Tridents under construction. The full effect of these budget changes may not be known until Electric Boat formally changes its budgets.

CONCLUSIONS

In the past, Electric Boat has continually underestimated the number of direct labor hours--the single largest cost element in submarine construction--needed to construct these submarines. In developing proposed labor hours for negotiating original contract costs, Electric Boat used anticipated savings from productivity and facilities improvements that were overly optimistic and unproven. Also, these savings were applied to submarines which were in the early phase of construction rather than to actual experience with submarines already completed or substantially completed. Although the Navy knew the budgets were unrealistically low, it continued to use them as the basis for original and updated contract costs.

Cost growth will continue at Electric Boat because direct labor budgets, although revised over the years, still do not reflect all the hours needed to complete the SSN-688 and Trident programs. This growth is in addition to that reported by Electric Boat up to June 27, 1981, and over and above any future growth which may occur because of contract changes or modifications. We believe that to effectively manage and control costs and measure performance at Electric Boat, realistic cost estimates must be established to complete remaining SSN-688 and Trident submarines under contract. The Trident and SSN-688 contracts awarded in January and February 1982, respectively, reflect substantial increases in direct labor hours to build SSN-688 and Trident submarines over previous contracts. The Navy believes pricing structures and target costs for these contracts are reasonable. This should minimize the cost growth problems experienced in the past.

RECOMMENDATION

We recommend that the Secretary of Defense direct that realistic estimates for contracts at Electric Boat be developed and reported by the Navy to the Office of the Secretary of Defense and concerned congressional oversight committees. These estimates should be prepared by those intimately involved in the two submarine programs and objectively verified by an independent organization within Defense. A good candidate for this verification would be the Cost Analysis Improvement Group within the Office of the Secretary of Defense. Actual experience acquired on submarines already delivered or substantially completed offers a good starting point for preparing these estimates.

AGENCY AND CONTRACTOR COMMENTS AND OUR VIEWS

The Department of Defense stated that we improperly defined cost growth and assumed a relationship between cost growth at Electric Boat and growth in the Navy budget. Further, it stated that we implied throughout the report that the Navy knowingly entered into contracts, specifically on the SSN-688 V (719 and 720) contract, at target costs which were understated.

Our use of target costs to measure a contractor's cost growth is consistent with the cost, schedule, and performance criteria specified in Department of Defense Instruction 7000.2 which is used by the Navy and Electric Boat. Defense's statement that we assumed a relationship between cost growth at Electric Boat and growth in the Navy budget is misleading. It was not our intention to relate the Navy budget to cost growth. The report clearly addresses cost growth under the contracts and states that contract target costs, which are the base for measuring contractor cost growth, have been and continue to be based on Electric Boat's unrealistically low direct labor hour budgets. The Navy knowingly uses these estimates.

Electric Boat stated that our discussion regarding cost growth was a resurrection of past problems focusing on the SSN-688 I and II bid estimates of the early 1970s. Further, they stated we did not give proper recognition to the imbalance of various trades in the labor work force during 1980 and 1981 due to the weld review program and the high concentration of ships at the waterfront or to cost savings resulting from the automated cylinder manufacturing facility at Quonset Point.

A resurrection of past problems could not be avoided in presenting an assessment of future cost problems. Our report does give sufficient weight to the issues mentioned by Electric Boat. Our analyses specifically excluded costs and direct labor hours associated with the weld, paint, and nonconforming steel problems. Furthermore, we believe our analyses depict the reasonable costs, in terms of direct labor, necessary to construct an SSN-688 and Trident submarine under normal operating conditions. Any adverse impact on productivity for any reason will result in an increase in those costs.

Nowhere in our report do we challenge Electric Boat's expertise in developing savings from the new facility of Quonset Point. We do question the application of those savings to estimates for ships with little actual construction progress rather than to actual proven performance of ships significantly further along in the construction process or already delivered. In effect, estimates were applied to estimates. Moreover, our conclusions are supported by the manner in which Electric Boat developed estimates for its proposal for the most recent SSN-688. In developing the SSN-719 and -720 estimates, Electric Boat applied savings to a boat less than 5-percent complete. In its most recent SSN-688 proposal which resulted in a contract award in February 1982, Electric Boat applied these savings to a boat nearly 65-percent complete.

CHAPTER 4

MANAGEMENT ATTENTION NEEDED TO MEET SCHEDULED SUBMARINE DELIVERIES

Scheduled delivery dates for some SSN-688s and Tridents beyond 1982 may not be met unless unfavorable human resources and productivity trends at Electric Boat are reversed. Electric Boat decided that it would, and did in fact, deliver six SSN-688s and one Trident in 1981. In meeting that commitment, Electric Boat concentrated its labor force on these boats at the expense of the remaining submarines still under construction. Consequently, Electric Boat must make up lost progress on some remaining submarines within current schedules to meet their delivery dates. The Navy, however, believes that current delivery schedules provide reasonable calendar time frames for construction and sufficient flexibility for orderly and timely deliveries.

The Navy's optimism is clouded, however, by its recent testimony on March 17, and 31, 1982, before the Congress when it stated that Electric Boat will be late in meeting contract schedule deliveries for six of the eight Trident submarines unless Electric Boat takes strong management actions. The Navy stated that until the fundamental issue of productivity is vigorously addressed, past Navy and Electric Boat problems will recur.

REVISED SCHEDULES PROVIDE SUFFICIENT CALENDAR TIME FOR DELIVERY

Navy officials believe that the latest revised schedules provide sufficient calendar time to meet revised scheduled delivery dates. Although the Trident program is new and only the lead boat has been delivered, Navy officials believe the schedule is realistic and Electric Boat should achieve scheduled delivery dates. For the SSN-688, however, insufficient time between several key events during the construction period may cause potential problems in meeting certain milestones within the construction period.

In the absence of new work, Electric Boat stated it was forced to reschedule remaining work to ensure that an adequate industrial base would be available to construct future submarines. In April 1981 Electric Boat unilaterally extended the delivery dates for the SSN-688s, claiming that it needed to maintain a nucleus of skilled submarine workers. The Navy, however, disagreed with these extended dates and opened discussions with corporate officials. As a result, on July 22, 1981, Electric Boat again revised SSN-688 delivery dates, but this time showing dates several months earlier than the April revision. In August 1981 the Navy and Electric Boat agreed to the revised contractual Trident delivery dates. Table 2 on page 17 summarizes the revisions to both the SSN-688 and Trident program delivery schedules as of December 1981 which incorporates the July and August 1981 changes.

Start-to-delivery time frames appear adequate

Construction time frames at Electric Boat were adversely affected by quality assurance, design, and other problems reported by both the contractor and the Navy during congressional testimony in March 1981. The current delivery schedules reflect the impact of these past problems on delivery dates and provide realistic calendar time frames for construction start to delivery.

The average construction time for SSN-688s delivered by Electric Boat is about 79 months, while the new schedules for the 688 V contract (SSN-719 and -720) provide about a 65-month construction period. Although this is a significant reduction, Navy officials believe the time frames are realistic and provide sufficient calendar time to meet schedule delivery dates. Moreover, Newport News, the only other builder of the SSN-688 class submarine, has generally delivered SSN-688s in an average of 66 months. Table 3 on page 18 summarizes the construction time frames for undelivered SSN-688s and Trident submarines at Electric Boat.

Little historical data is available for estimating the time needed to construct a Trident submarine. Although Electric Boat has constructed many earlier versions of ballistic missile class submarines, the Trident is significantly different. Not only is it larger, but it is far more sophisticated and complex than any previous generation of ballistic missile submarines. The only actual experience on which to estimate construction time frames has been the lead Trident which took 89 months to construct. Lead ships, however, invariably have longer construction periods than the follow-on ships, especially when, like the Trident, they are a new design.

In spite of little historical data, the former General Manager of Electric Boat and the Navy believe a 68-month construction time frame is realistic to build a Trident. In all cases, Electric Boat's new schedules provide at least a 68-month construction period.

Table 2

Electric Boat Division
Delivery Schedules

Contract	Ship	Electric Boat: Original contract	Dec. 1980 estimate	Apr. 1981 estimate	Current contract dates
SSN-688:					
N00024-71-C-0268	690	6/75	6/77	a/6/77	N/A
(688 I contract	692	10/75	3/78	a/3/78	"
for 7 boats)	694	2/76	6/78	a/6/78	"
	696	6/76	3/79	a/1/79	"
	697	10/76	8/79	a/11/79	"
	698	2/77	10/79	a/2/81	"
	699	6/77	2/80	a/3/81	"
N00024-74-C-0206	700	10/77	6/80	a/6/81	"
(688 II contract	701	2/78	10/80	a/9/81	"
for 11 boats)	702	7/78	2/81	a/12/81	"
	703	11/78	6/81	a/12/81	"
	704	1/79	2/82	6/82	6/82
	705	5/79	6/82	12/82	12/82
	706	9/79	10/82	6/83	5/83
	707	1/80	1/83	12/83	10/83
	708	5/80	9/83	6/84	3/84
	709	9/80	1/84	12/84	9/84
	710	1/81	5/84	6/85	2/85
N00024-79-C-2720	719	8/84	8/84	12/85	6/85
(688 V contract	720	3/85	3/85	6/85	11/85
for 2 boats)					
Trident:					
N00024-75-C-2014	726	4/79	6/81	a/10/81	a/10/81
(Trident I con-	727	4/80	11/81	10/82	9/82
tract for 4	728	12/80	7/82	8/83	6/83
boats)	729	8/81	3/83	4/84	2/84
N00024-75-C-2014	730	4/82	11/83	12/84	10/84
(Trident II con-	731	12/82	7/84	8/85	6/85
tract for 3	732	8/83	3/85	4/86	2/86
boats)					
N00024-80-C-2201	733	5/86	5/86	12/86	10/86
(Trident III con-					
tract for 1 boat)					

a/Actual delivery month.

Table 3

Electric Boat Division
Estimated Length of Construction
for Undelivered Boats
as of December 1981

		Start of construction	Estimated delivery	Estimated months to construct
SSN-688	704	7/16/76	6/26/82	72
	705	8/15/76	12/24/82	76
	706	3/24/77	5/28/83	74
	707	6/27/77	10/22/83	76
	708	10/27/77	3/17/84	77
	709	5/30/78	9/04/84	75
	710	3/20/79	2/16/85	71
	719	1/04/80	6/29/85	66
	720	7/25/80	11/30/85	64
Trident	727	8/19/75	9/30/82	85
	728	2/27/76	6/30/83	88
	729	2/11/77	2/29/84	85
	730	2/28/78	10/31/84	80
	731	4/06/79	6/29/85	76
	732	10/12/79	2/28/86	76
	733	2/17/81	10/31/86	68

Some time frames between key events for the SSN-688 may be insufficient

Although the total time frame from start to finish may be adequate, the time between key events may be insufficient in several critical areas. For example, the following table shows several instances of such insufficient time frames.

Table 4

Time Frames Between Key Events

Key event	Average	Scheduled months to construct SSN-706	SSN-708	SSN-710	SSN-720
Initial reactor fill to launch	2	1	1	1	1.5
Launch to criticality	15	9.5	9.5	9.5	9.5
Criticality to first sea trials	4	2.5	3	2.5	3.5

According to the Navy, the schedule intervals used are not valid measures of performance. Initial reactor plant fill, for example, is not related to launch and could occur either before or after launch without affecting the test program or ships' delivery schedules. These key events, however, are 3 of the 10 critical milestones identified in the Secretary of the Navy's task force report of April 20, 1981. SUPSHIP monitors Electric Boat's performance in meeting these events and reports that information monthly to the Secretary of the Navy. Regardless of the interchangeability of these events, this is the schedule the Navy uses to evaluate Electric Boat's progress toward the orderly and timely delivery of submarines.

The Navy suggests that flexibility in other parts of the schedule may cancel out any problems in meeting the restrictive time frames. Past experience, for example, shows 14 months between installing the main propulsion equipment and initially filling the reactor, whereas Electric Boat allows about 17 or 18 months between these events.

UNFAVORABLE EFFICIENCY TRENDS POINT TO LATE DELIVERIES

While the calendar time for construction may be adequate, some of the remaining submarines scheduled for delivery beyond 1982 may be late unless Electric Boat makes more efficient use of its work force. In early 1981 unfavorable variance trends in labor performance and progress were eliminated by Electric Boat revising its schedules. However, as of August 1981, unfavorable variances were again becoming evident. While these variances may be attributed to Electric Boat's quest to deliver six SSN-688s and one Trident in 1981, the trends must soon be reversed to ensure that the delivery dates of the remaining submarines will be met. On two separate occasions in March 1982, in testimony before the Congress, the Navy stated that Electric Boat will be late in meeting contract schedule deliveries for six of the eight Trident submarines unless Electric Boat takes strong management actions. The Navy also stated that until the fundamental issue of productivity is vigorously addressed, past Navy and Electric Boat problems will occur.

Revising schedules eliminates unfavorable labor hour variances

To support its scheduled delivery dates, Electic Boat developed a plan which shows the number of direct labor hours needed to construct a submarine. These hours are time phased over the construction period to arrive at the scheduled or planned hours needed each month to meet delivery dates in an orderly and timely fashion. This data can be used to develop comparisons of the amount of work scheduled and the amount accomplished in terms of direct labor hours. This in turn can be used to determine if the scheduled progress is being met.

Ordinarily, trend analyses of this data provides a "snapshot" view of a contractor's track record toward meeting estimated delivery dates. However, Electric Boat's numerous scheduling changes make it difficult to assess this track record. Each time schedules are revised, unfavorable variances are eliminated, new plans are developed, and new baselines are established for measuring efficiency and performance.

Before the mid-1981 delivery schedule revision, Electric Boat reported significant unfavorable variances in terms of monthly progress and labor performance. After the adjustments, not only were the unfavorable variances eliminated, but favorable variances were reported. However, as of December 1981, Electric Boat was again reporting unfavorable variances for monthly labor progress and performance. These unfavorable trends began in August and have continued each month for most SSN 688 and Trident submarines. Electric Boat's decision to use many more hours per month than planned to complete submarines scheduled for 1981 delivery has contributed to the current unfavorable trends. This decision has diverted human resources from other submarines with later delivery dates and may jeopardize Electric Boat's ability to meet those dates.

CONCLUSIONS

The Navy maintains that the most recently revised delivery schedules for both the SSN-688 and Trident consider the impact of past shipyard problems on delivery dates and provide realistic calendar time frames for construction and sufficient flexibility for orderly and timely deliveries. Although some time frames between key events for the SSN-688 class are restrictive, others are liberal enough that they may cancel each other out.

Electric Boat delivered six SSN-688s and one Trident in 1981. In achieving these deliveries, Electric Boat concentrated its labor force on these submarines at the expense of some of the remaining submarines still under construction. Consequently, Electric Boat must make up lost progress on follow-on boats, within current schedules, to meet their future delivery dates. This would require staffing rates well beyond the norm. In any event, the success of meeting scheduled delivery dates beyond 1982 will depend on Electric Boat's ability to effectively use its facility and work force. We believe a close watch must be maintained to ensure that corrective action is taken if it is necessary to reverse unfavorable human resources and productivity trends at Electric Boat.

RECOMMENDATIONS

We recommend that the Secretary of Defense direct the Navy to maintain close surveillance over the contractor's activities to identify progress being made or indications of unfavorable trends. If problems are indicated, corrective measures must be taken to minimize potential problems. If the unfavorable trends are the result of factors beyond the control of the Navy or the contractor (e.g., labor and skill shortages and other economic

influences), at least the problems will be recognized and surprises to the public and the Congress will be avoided. We further recommend that the Congress be periodically apprised of progress being made at Electric Boat and the impact any unfavorable trends may have on cost and scheduled deliveries at Electric Boat.

AGENCY AND CONTRACTOR COMMENTS AND OUR VIEWS

The Department of Defense agrees with our conclusion that some delays in submarine deliveries may occur beyond 1982 unless Electric Boat corrects unfavorable human resources and productivity trends.

Electric Boat, however, stated that our analyses of their schedules are inadequate. Further, they state that the diversion of human resources necessary to deliver seven ships in 1981 did cause a trade imbalance, but it did not result in unrecoverable delays. Electric Boat also stated that improvements in productivity must take place to achieve its current estimates for scheduled deliveries on both the SSN-688 and Trident programs and that it expects the steps that have been taken and are being taken will result in the necessary improvements. Our report clearly states that unless these unfavorable trends are reversed, schedule delays may result.

Both the Department of Defense and Electric Boat disagreed with our draft report proposal that the Secretary of Defense direct the Navy to jointly develop with Electric Boat plans for adequately manning the shipyard for the remaining submarines under contract. This proposal was deleted and in its place we now recommend that the Congress be periodically apprised of progress being made at Electric Boat and the impact any unfavorable trends may have on cost and scheduled deliveries at Electric Boat.

APPENDIX I

U.S. House of Representatives
COMMITTEE ON ARMED SERVICES
Washington, D.C. 20515
NINETY-SEVENTH CONGRESS
MELVIN PRICE (ILL.), CHAIRMAN

April 6, 1981

Honorable Milton J. Socolar
Acting Comptroller General of the
United States
441 G Street, N.W.
Washington, D.C. 20548

Dear Mr. Socolar:

Recent testimony on the status of construction of the nuclear-powered Trident ballistic missile submarines and SSN-688 attack submarines at General Dynamics, Electric Boat Division, Groton, Connecticut, revealed considerable differences of opinion on the reasons for construction delays in both shipbuilding programs.

I would like to request, on behalf of the Subcommittee on Seapower and Strategic and Critical Materials, that the General Accounting Office provide a comparative analysis of the testimony presented to the subcommittee on March 12, 1981 by Vice Admiral Earl E. Fowler, Jr., Commander, Naval Sea Systems Command, and on March 25, 1981 by Mr. P. Takis Veliotis, General Manager, Electric Boat Division.

Specifically, the subcommittee would like to have a side-by-side comparison of the Navy and Electric Boat testimony and a summary showing where both sides agree on the cause of the problems, where they disagree as to the cause of problems, and particularly, where they disagree as to the possibility and time required for effective solutions. From such a comparison, key questions remaining as to the scheduling of work at the Electric Boat facility could be summarized.

It is hoped that your office could then provide a more detailed analysis of the facts concerning the ability of the Electric Boat Division of General Dynamics to produce Trident and SSN-688 submarines in the future in a timely and cost-effective manner.

APPENDIX I

April 6, 1981

These submarine programs are among the highest priority requirements of the Department of Defense.

We would appreciate an interim assessment by May 4, 1981 and a full report, including suggestions your office might have for future courses of action by the Congress, by August 1, 1981.

Sincerely,

Charles E. Bennett

Charles E. Bennett
Chairman
Subcommittee on Seapower and
Strategic and Critical Materials

APPENDIX II

U.S. House of Representatives
COMMITTEE ON ARMED SERVICES
Washington, D.C. 20515
NINETY-SEVENTH CONGRESS
MELVIN PRICE (ILL.), CHAIRMAN

May 29, 1981

The Honorable Milton J. Socolar
Acting Comptroller General of the United States
441 G Street, N.W.
Washington, D.C. 20548

Dear Mr. Socolar:

On May 4, 1981, representatives of the General Accounting Office presented to me a preliminary report on the differing viewpoints expressed by the Navy and General Dynamics, Electric Boat Division on the progress and administration of the submarine shipbuilding programs at Groton, Connecticut.

At that time I requested that the GAO continue its analysis of the Trident and attack submarine programs at E.B. and provide the subcommittee with periodic progress reports. I agreed to set a date of February 1, 1982 for presentation of a final written report to the subcommittee.

The GAO representatives expressed a desire to visit the submarine building facilities at Newport News Shipbuilding and Drydock Company, Newport News, Virginia for purposes of comparison of management and production activities between the only two shipyards building the SSN-688 attack submarines. I have no objection to such procedure if it will help the GAO in its analysis of the prospects for future delivery of SSN-688's at E.B.'s Groton facility.

Sincerely,

Charles E. Bennett

CHARLES E. BENNETT
Chairman
Seapower Subcommittee

CEB:lkj

APPENDIX III

Congress of the United States
House of Representatives
Committee on Appropriations
Washington, D.C. 20515

June 24, 1981

Honorable Milton J. Socolar
Acting Comptroller General of the
United States
U. S. General Accounting Office
Washington, D. C. 20548

Dear Mr. Socolar:

The General Dynamics, Electric Boat Division, Groton, Connecticut, and the Newport News Shipbuilding and Drydock Company, Newport News, Virginia, are both under contract with the U. S. Navy for the construction of nuclear powered SSN-688 class attack submarines. I am requesting that the General Accounting Office initiate, as a matter of priority, a review to determine the reasons for the differences in performance between Electric Boat and Newport News on the SSN-688. Specifically, at both locations, I would like to know what the underlying reasons are for the differences between the contractors for manhours and costs per delivered SSN-688, changes in estimates for completion of boats under construction, and the rationale and reasons behind delivery schedule changes. I am particularly interested in how both contractors will achieve their current estimates for delivery, cost, and manhours.

With respect to the construction problems Electric Boat has encountered, I would like to know the current status and what steps that the Navy and Electric Boat have taken to preclude their recurrence. It would also be worthwhile to determine the differences, if any, in the Navy's quality control programs at both Electric Boat and Newport News.

With respect to the SSN-688 program, the Navy is planning to provide Vertical Launch System capability. A limited amount of funds (R&D) have been appropriated prior to fiscal year (FY) 1982. However, the FY 1982 budget requests procurement funds for SSN-688 VLS. I support increasing the capability of our SSN-688's. However, I am concerned whether the concurrency between R&D and procurement, in this case, is excessive and will possibly affect the delivery of the ships that are planned to be retrofitted with this system.

APPENDIX III

In addition to the above, I would be interested in your response to two questions regarding the effects of certain provisions concerning the costs of correcting defective workmanship and materials in shipbuilding contracts.

First, determine to what degree the contract price adjustment language originally contained in H.R. 3512 affects defense contractors with respect to additional costs caused by their own defective workmanship. Will the language adequately ensure that the Government will not have to assume the added costs resulting from a contractor's own defective workmanship and materials, without affecting the contractors' right generally to make legitimate claims outside the area of defective performance?

Secondly, the House-passed bill originally stated that contractors were not to be reimbursed for "the cost of insurance that would compensate the contractor for correction of his own defective materials and workmanship". As enacted, the FY 1981 supplemental appropriation act precludes reimbursement by the Government for premiums for commercial insurance (other than insurance normally maintained by the contractor in connection with the general conduct of his business) covering the costs of correcting defective workmanship or materials incident to the normal course of construction (those defects in materials or workmanship which do not constitute a fortuitous or casualty loss). Does the provision in the Act significantly narrow the types of insurance for which Government reimbursement of premiums is prohibited?

Since the Subcommittee is contemplating hearings in mid-July on the Trident and SSN-688 programs, I would appreciate your office giving this request prompt attention. I will leave it to our respective staffs to work out some mutually agreeable approaches and time frames for completing the review as the Subcommittee does recognize the complexities inherent in this request.

Sincerely,

Joseph P. Addabbo
Chairman
Subcommittee on Defense

OUR REPORTS ON THE SSN-688 AND TRIDENT PROGRAMS

GAO Staff Study, High Speed Nuclear Attack Submarines SSN-688 Class (Feb. 1971, classified Confidential).

GAO Staff Study, High Speed Nuclear Attack Submarines SSN-688 Class (Mar. 1972, classified Confidential).

GAO Staff Study, SSN-688 High Speed Nuclear Attack Submarine (Feb. 1973, classified Confidential).

GAO Staff Study, Trident System (Mar. 1973, classified Secret).

Selection of a West Coast Site for the Navy's Proposed Trident Support Complex (B-178056, Nov. 14, 1973).

GAO Staff Study SSN-688 High Speed Nuclear Attack Submarine (Mar. 1974, classified Confidential).

Review of Production Schedules for SSN-688 and Trident Submarines at Electric Boat Division, General Dynamics Corporation, Groton, Connecticut (PSAD-75-47, Jan. 21, 1975).

SSN-688 Attack Submarine (PSAD-76-120, Mar. 25, 1975).

GAO Staff Study, Trident Submarine and Missile Systems (PSAD-76-123, Mar. 26, 1976, classified Confidential).

Status of the Trident Submarine and Missile Programs (PSAD-77-34, Mar. 8, 1977).

Status of the SSN-688 Class Attack Submarine Program (PSAD-77-45, Mar. 18, 1977, classified Secret).

The Effectiveness of the Attack Submarine in the Direct Support Role (PSAD-77-89, April 29, 1977, classified Secret).

Planning Federal Assistance to Communities Affected by the Trident Submarine Base, Washington State (LCD-77-320, June 8, 1977).

Review of the Navy's Fiscal Year 1978 Appropriation Request for Trident Support Facilities Construction Program (LCD-77-350, June 22, 1977).

Analysis of the Need for Additional Family Housing at the Navy's Trident Submarine Base (CED-78-49, Feb. 9, 1978).

Status of Navy's SSN-688 Class Attack Submarine Program (PSAD-78-21, Feb. 27, 1978, classified Secret).

The Navy's Trident Fleet--Some Success but Several Major Problems (PSAD-78-31, Apr. 7, 1978).

Review of Navy's Fiscal Year 1979 Appropriation Request for Funds to Construct Trident Base Support Facilities and for Community Impact Assistance (LCD-78-328, June 14, 1978).

The Trident and SSN-688 Submarine Construction Programs--Status and Issues (PSAD-79-18, Feb. 9, 1979, classified Secret).

Two Contracts for Nuclear Attack Submarines Modified by Public Law 85-804--Status as of December 23, 1978 (PSAD-79-107, Oct. 2, 1979).

Alternatives to Consider in Planning Integrated Logistics Support for the Trident Submarine (LCD-79-415, Sept. 28, 1979).

Two Contracts for Nuclear Attack Submarines Modified Under Authority of Public Law 85-804--Status as of Dec. 22, 1979 (PSAD-80-68; Aug. 18, 1980).

Two Contracts for Nuclear Attack Submarines Modified Under Authority of Public Law 85-804--Status as of December 20, 1980 (PLRD-82-2, Oct. 20, 1981).

APPENDIX V

THE UNDER SECRETARY OF DEFENSE

WASHINGTON O C 20301

RESEARCH AND
ENGINEERING

2 [illegible] 1982

Mr. W. H. Sheley, Jr.
Director
Mission Analysis and Systems Acquisition Division
United States General Accounting Office
Washington, D.C. 20451

Dear Mr. Sheley:

This is in reply to your letter of January 19, 1982, to the Secretary of Defense, forwarding for comment a draft report, "Cost Growth and Delivery Delays in Submarine Construction at Electric Boat Are Likely to Continue," Code 951626 (OSD Case #5864).

We agree that there is room for improvement in quality assurance programs. However, we disagree with the draft report's conclusion that both the Navy and Electric Boat Division quality assurance programs are defective. That conclusion was based on a lack of understanding of the quality assurance program and the specific responsibilities assigned to Electric Boat and the Supervisor of Shipbuilding. Both the Navy's and Electric Boat's Quality Assurance Programs are considered satisfactory, meet contractual requirements and are correcting identified weaknesses. Therefore, we disagree with the recommendation that the Secretary of Defense require the Navy to correct the deficiencies identified in its quality assurance program. Submarines accepted by the Navy from Electric Boat are safe and reliable ships. Trial results for the seven submarines delivered in 1981 were excellent as substantiated by the Board of Inspection and Survey.

We disagree with your report's assumption that contract cost at completion exceeding target cost equates to cost growth as well as your conclusion that the Navy contributes to cost growth by knowingly entering into contracts at target costs which are understated. Navy budgets are based on Navy estimates which are formed initially before receipt of a contractor proposal. Target costs are the basis for measuring growth in the contractor's estimated cost-to-complete the contract, not a measure of Navy budget cost growth. The Navy budget must include a basic ship construction price equal to or greater than the target price.

Further, your report's recommendation to establish realistic cost estimates to complete remaining submarines under contract fails to consider Navy's systematic Ship Cost Adjustment Reviews which measure funds available for construction against the Project Manager's best estimate of cost at completion. Each year, as necessary, cost growth and/or escalation funding is requested of Congress to fully fund to the best estimate of cost at completion. These procedural results are reviewed by the Office of the Secretary of Defense in preparing the annual budget request and are evaluated independently to insure

that they reflect the best information available, including return costs on completed ships. As part of this normal review practice, the Navy and the OSD Cost Analysis Improvement Group plan to conduct an independent review of SSN 688 and Trident submarine costs. We agree that scheduled delivery dates for some of the remaining submarines under contract at Electric Boat will not be met unless unfavorable manpower and productivity trends at Electric Boat are reversed. However, we do not agree with the recommendation that the Secretary of Defense direct the Navy to develop plans jointly with Electric Boat for adequately manning the shipyard for the remaining submarines under construction. There is no contractual provision for such Navy involvement in contractor management, particularly with respect to the contractor's application of resources.

More detailed comments regarding quality assurance programs, cost growth and schedules are provided in Attachment 1 to this letter.

Although we are in disagreement with some listed conclusions and recommendations, the Navy will continue to maintain enhanced vigilance over the quality assurance system to insure it remains effective. Further, the Navy is taking the appropriate action to make certain the contractor's management control systems meet contractual requirements. I wish to assure you that this Department and the Electric Boat Division do not want to see a repeat of the past history of ship delays, cost overruns, etc.

In view of the level of corrections provided in Attachment 2 and disagreement with the subject report, I recommend that it not be published as now written. A report of this nature would be detrimental to the improved working relationship between the Navy and Electric Boat Division and does not recognize the accomplishments of the past year. If it is to be published, I recommend that the comments of the Electric Boat Division and of the Department of Defense be included in the text.

We appreciate the opportunity to comment on this draft report. I recommend a conference between DoD and GAO to discuss this report in detail. [See GAO notes 1 and 2.]

Sincerely,

James D. Wade, Jr.
for Richard D. DeLauer

Attachments

GAO notes:

1. Defense's written comments, which did not change the thrust of our draft report or its conclusions, did result in changes which were incorporated in a draft provided to Defense in advance of a March 25, 1982, meeting between Defense and ourselves. As a result of that meeting, no substantial additional changes were made.

2. Attachments to this letter provided further amplification on the issues discussed in the report. They are not included because they are too voluminous.

APPENDIX VI

GENERAL DYNAMICS
Electric Boat Division
Eastern Point Road Groton, Connecticut 06340

Date: February 24, 1982

Subject: United States General Accounting Office (GAO) Draft of Proposed Report Titled "Cost Growth and Delivery Delays in Submarine Construction at Electric Boat are Likely to Continue"

Reference: (a) United States General Accounting Office Letter (W. H. Sheley, Jr.) to Electric Boat Division (A. M. Barton), dated January 19, 1982, same subject.

Enclosure: Electric Boat Division Comments on Draft GAO Report

Mr. W. H. Sheley, Jr., Director
United States General Accounting Office
441 G Street N.W.
Mission Analysis and Systems
Acquisition Division
Washington, D.C. 20548

Dear Mr. Sheley:

Electric Boat Division has received and reviewed the January 1982 draft of the proposed report entitled "Cost Growth and Delivery Delays in Submarine Construction at Electric Boat are Likely to Continue."

The Division strongly objects to the content of this report as it misrepresents the steps that have been taken by both Electric Boat and the Navy over the past two years. This report incorrectly implies a continuation of previous problems in the area of Quality Assurance, schedule and cost at Electric Boat, thereby treating issues that have long since been resolved as though they were current problems. Moreover, certain issues are taken out of context and erroneous conclusions are drawn. There are allegations in the report which reference the reader further into the report where the same allegation is merely repeated, but still without supporting data. The very title of the report "Cost Growth and Delivery Delays in Submarine Construction at Electric Boat are Likely to Continue" is more in the nature of a headline than the title to an audit report. Electric Boat Division requests the title be changed to "Review of the SSN688 and Trident Submarine Construction Programs at Electric Boat."

APPENDIX VI

Any objective report would identify the accomplishments of 1981 to give the reader a balanced view of the situation. Principal accomplishments that should be noted in the report:

(1) The welding, nonconforming steel and paint issues were resolved in late 1980 and early 1981.

(2) The Quality Assurance issue was resolved in late 1980. Electric Boat's Quality program was audited and accepted by the Navy in November 1980 and again in November 1981. Also as recently as February 1982 the Navy accepted the Division's Quality Program Management Plan.

(3) The Government Furnished Equipment (GFE) and design change issues were resolved with the Navy in August 1981 and new contract delivery dates were set for the Trident Program.

(4) The OHIO, the first Trident submarine, was delivered on October 28, 1981.

(5) Electric Boat met its commitment made a year ago to deliver six SSN688's and one Trident in the year 1981.

(6) The Navy and Electric Boat executed a contract for the construction of the 9th Trident with options for two more on January 7, 1982.

(7) The insurance reimbursement issue has been resolved.

(8) On February 11, 1982 the Navy awarded Electric Boat an additional SSN688 submarine.

(9) The working relationship between the Navy and Electric Boat has been significantly improved over the past year.

By ignoring these items the report merely focuses on remaining minor problems. The examples cited by the GAO in its comments on Quality Assurance were misunderstood by the GAO auditors as our attached remarks demonstrate. Electric Boat has devoted all the necessary resources to upgrade its Quality Assurance Program to a level which may well exceed that of any United States shipyard.

The allegation regarding cost growth is in large measure a resurrection of past problems which primarily focus on the 688 I and II bid estimates of the early 1970's. This has no relevance to the current operation at Electric Boat. Further the GAO should have recognized that during the years of 1980 and 1981 (in 1980 due to the weld review program and 1981 due to

the high concentration of ships at the waterfront) a significant trade imbalance created a basic productivity problem which is now behind us. Any projections made using those years must account for those trade imbalances to be meaningful. In addition, little mention is made of the Automated Cylinder Manufacturing Facility, newly installed at Quonset Point, and the cost savings which are being achieved through the use of this facility.

The GAO's analyses of our schedules are inadequate. The schedules which were deemed impossible for 1981 were met. The deliveries scheduled for 1982 will be met. The report says we "may" miss delivery dates on later ships, presumably those scheduled in 1984 and 1985. The Division is concerned that questioning our delivery projections in the out-years may become an annual event even though near-term delivery dates are consistently being met, as was the case in 1981.

In summary, the content of this GAO report is less than completely accurate, it misrepresents this Division's quality, cost, and schedule commitments to the Navy's vital shipbuilding program, and again raises questions which this Division has already previously addressed. It is therefore suggested that this draft be withdrawn and no report issued. If the GAO insists on issuing a report, the Division expects that GAO will make corrections/changes to the report to present the current status of the SSN688 and Trident Construction Programs at Electric Boat in a fairer and more accurate perspective. It is also requested that a copy of this letter and its enclosure, which contains specific comments on the draft report, be included with any GAO report which may ultimately be issued.

Very truly yours,

GENERAL DYNAMICS
Electric Boat Division

A. M. Barton
Assistant General Manager,
Planning and Control

GAO note:

The enclosure to this letter provides further amplification on the issues discussed in this report. They are not included because they are too voluminous and the gist of the comments are included in our report. These Electric Boat comments did not change the thrust of our report or its conclusions.

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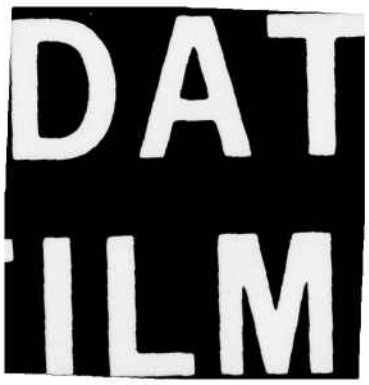
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